AMENDMENTS TO THE SPECIFICATION

Kindly replace paragraph [0007] with the following amended paragraph:

[0007] MEMS (Micro-Electro Mechanical System) is a technology implementing mechanical and electrical parts using a semiconductor manufacturing process. A fluxgate may be minimized and integrated using MEMS technology. A fluxgate manufactured by a MEMS manufacturing process for a ~~potable~~ portable small-size terminal is generally used when there is a limited power source. Therefore, characteristic high current consumption of a fluxgate in a unit time interval can be a significant problem.

Kindly cancel paragraphs [0009] through [0014].

Kindly add the following new paragraphs after paragraph [0008]:

[0009] At least one of the above and other features and advantages of the present invention may be realized by providing a sensing apparatus having a fluxgate including a driving coil for exciting a magnetic substance core with a current, first and second current amplifiers for applying the current to first and second ends of the driving coil, a pulse generator for generating a pulse to turn on/off the first and second current amplifiers, and a pulse controller for outputting a control signal allowing the pulse to be applied to the first and second current amplifiers, the pulse controller outputting the control signal at a start of a sensing cycle, the fluxgate generating an analog signal due to the excited magnetic substance, and an A/D converter for converting the analog signal from the fluxgate into a digital signal, wherein the pulse controller stops outputting the control signal when the A/D converter outputs the digital signal to the pulse controller.

[0010] The sensing apparatus may further include an AND gate for logical AND-ing the pulse from the pulse generator with the control signal from the pulse controller to send an output signal to the first and second current amplifiers. The pulse controller may output a high level signal during conversion of the analog signal from the fluxgate, and the pulse controller may output a low level signal when the conversion of the analog signal into the digital signal by the A/D converter is complete and the A/D converter outputs the digital signal to the pulse controller. The pulse controller may output the low level signal a predetermined time period after the conversion of the analog signal into the digital signal is complete and the A/D converter outputs the digital signal to the pulse controller.

[0011] At least one of the above and other features and advantages of the present invention may be realized by providing a sensing apparatus having a fluxgate including a pulse controller for generating a pulse to block current from flowing into a driving coil of the fluxgate when it is determined that conversion of an analog signal from the fluxgate to a digital signal is completed by an A/D converter and the A/D converter outputs the digital signal to the pulse controller.

[0012] At least one of the above and other features and advantages of the present invention may be realized by providing a control method of a sensing apparatus having a driving coil for exciting a magnetic substance core with current, first and second current amplifiers for applying current to first and second ends of the driving coil, respectively, a fluxgate with a pulse generator for generating a pulse to turn on/off the first and second current amplifiers, an A/D converter for converting an analog signal from the fluxgate into a digital signal, and a pulse controller for outputting a control signal for controlling the pulse generator, the control

method including a) driving the pulse generator when the fluxgate initiates a drive and outputting a first control signal in order for the pulse generated from the pulse generator to be applied to the first and second current amplifiers, and b) outputting a second control signal in order for the pulse generated from the pulse generator not to be applied to the first and second current amplifiers when the conversion of the analog signal into the digital signal by the A/D converter is complete and the A/D converter outputs the digital signal to the pulse controller.

[0013] The control method may further include logical AND-ing in an AND gate in the sensing apparatus the pulse from the pulse generator with the control signal from the pulse controller to send an output signal to the first and second current amplifiers.

[0014] In the control method, in a) the pulse controller may output a high level signal as the first control signal to the AND gate, and in b) the pulse controller may output a low level signal as the second control signal to the AND gate.

Kindly replace paragraph [0023] with the following amended paragraph:

[0023] FIG. 2 is a circuit diagram showing a fluxgate according to an embodiment of the present invention, and FIG. 3 is a block diagram schematically showing a sensing apparatus having the fluxgate of FIG. 2. Referring to FIGS. 2 and 3, the sensing apparatus includes a fluxgate 100 for providing an analog sensor signal to an A/D converter 170 to be converted into a digital signal, and to transmit the digital signal to an external system [[by]] using the analog sensor signal from the fluxgate 100, a filter 180 and a signal transmitter 190. The fluxgate 100 includes a driving coil 150, first and second current amplifiers 130 and 131, an inverter 140, a pulse generator 120, an AND gate 160 ~~(of FIG. 4)~~ and a pulse controller 110.

Kindly replace paragraph [0024] with the following amended paragraph:

[0024] The driving coil 150 is wound on a magnetic substance core (not shown) to excite the magnetic substance core, on which a sensor coil (not shown) is also wound. The first and second current amplifiers 130 and 131 are connected to first and second ends a and b, respectively, of the driving coil 150 to apply current to the driving coil 150. The inverter 140 is connected to the second current amplifier 131 to invert an input signal and to transmit the inverted signal to the second current amplifier 131. The pulse generator 120 generates a pulse P1 to turn on/off the first and second current amplifiers 130 and 131. The pulse controller 110 outputs a control signal to control the pulse generator 120.

Kindly replace paragraph [0025] with the following amended paragraph:

[0025] As shown in FIG. 2, the pulse P1 is directly ~~inputted~~ input to the first amplifier 130, and thus current P2 having a same phase as that of the pulse P1 is applied to the first end a of the driving coil 150. The pulse P1 is inverted by the inverter 140 and ~~inputted~~ input to the second amplifier 131, and thus current P3 having an opposite phase to that of the pulse P1 is applied to the second end b of the driving coil 150. Since P2 and P3 are opposite in phase, when a high level signal is ~~inputted~~ input to the first end a of the driving coil 150 as shown by a point q_1, and a low level signal is ~~inputted~~ input to the second end b of the driving coil 150, current flows from a to b. When a low level signal is ~~inputted~~ input to the first end a as shown by a point q_2, and a high level signal is ~~inputted~~ input to the second end b, current flows from b to a. Since high/low level signals are ~~inputted~~ input in turn with respect to pulses, current is applied to the driving coil 150 to excite the magnetic substance core on which the driving coil 150 is wound.

Kindly replace paragraph [0026] with the following amended paragraph:

[0026] With the above configuration, the fluxgate 100 senses a magnetic field when the magnetic substance core is sufficiently excited as current flows along the driving coil 150, and then the sensor coil (not shown) outputs an analog sensor signal. The fluxgate 100 further includes an additional analog signal processing circuit (not shown) for processing the output analog sensor signal from the sensor coil. The processed analog sensor signal is converted into a digital signal to be transmitted to other systems [[by]] using the analog sensor signal.

Kindly replace paragraph [0027] with the following amended paragraph:

[0027] The analog sensor signal ~~outputted~~ output from the fluxgate 100 is ~~inputted~~ input to the A/D converter 170 to be converted into the digital signal. The A/D converter 170 is connected to the pulse controller 110 of the fluxgate 100 as shown by L_1, in order for the pulse controller 110 to detect when conversion of the analog sensor signal into the digital signal is completed. The filter 180 is connected to the A/D converter 170 to filter the digital signal. The signal transmitter 190 is connected to the filter 180 to transmit the filtered signal to the other systems [[by]] using the sensor signal from the fluxgate 100. The sensor signal from the fluxgate 100 is interfaced through the signal transmitter 190.

Kindly replace paragraph [0028] with the following amended paragraph:

[0028] With the above configuration, the fluxgate 100 of the sensing apparatus applies current to the driving coil 150 only while the sensor signal is A/D converted by the A/D converter 170 during one driving cycle of the sensing apparatus. To this end, the pulse to

turn on/off the first and second current amplifiers 130 and 131 that apply current to the first [[sand]] and second ends of the driving coil 150 is ~~inputted~~ input to the first and second current amplifiers 130 and 131 only during the A/D conversion.

Kindly replace paragraph [0029] with the following amended paragraph:

[0029] A detailed description of a control signal for pulse control according to an embodiment of the present invention will be presented hereinafter with reference to FIG. 4. FIG. 4 shows waveforms of signals for pulse control and a block diagram including the pulse controller 110. As shown in FIG. 4, a pulse A generated from the pulse generator 120 and a control signal B outputted from the pulse controller 110 are ~~inputted~~ input to the AND gate 160. The AND gate 160 logical ANDs the control signal B and the pulse A to output a signal C to the first and second current amplifiers 130 and 131.

Kindly replace paragraph [0030] with the following amended paragraph:

[0030] [[When]] For the fluxgate 100 ~~initiates~~ to initiate a drive, the pulse controller 110 inputs a driving signal to the pulse generator 120 to generate a pulse such as A, and begins to input a high level signal as a control signal B to the AND gate 160. The pulse A generated from the pulse generator 120 and the control signal B from the pulse controller 110 are logical AND-ed to output a signal C only while the control signal B is a high level signal.

Kindly replace paragraph [0033] with the following amended paragraph:

[0033] FIG. 6 shows a flow chart of a control method of the present invention. With respect to FIGS. 3-6, upon ~~deciding~~ determining that the fluxgate 100 initiates a drive (S10), the pulse controller 110 inputs a driving signal to the pulse generator 120 to generate a pulse

(S11), and inputs a high level signal, such as S_2, as a control signal B to the AND gate 160 (S12). During the inputting of the high level signal as the control signal B, the AND gate 160 outputs a pulse to the first and second current amplifiers 130 and 131. During the inputting of the pulse to the first and second current amplifiers 130 and 131, the driving coil 150 drives, and thus the fluxgate outputs an analog sensor signal. The analog sensor signal is ~~inputted~~ input to the A/D converter 170 to be converted into a digital signal. That is, a high level control signal such as S_2 is ~~inputted~~ input to the AND gate 160 at t_1, and an analog sensor signal such as S_1 is outputted from the fluxgate 100 and ~~inputted~~ input to the A/D converter 170, where it is converted into a digital signal at t_2.

Kindly replace paragraph [0034] with the following amended paragraph:

[0034] When the A/D conversion is completed at t_3 (S20), the pulse controller 110 detects the completion, and inputs a low level signal as a control signal B, such as S_2, to the AND gate 160 at t_4 (S21). The converted digital signal shown as S_3 is ~~inputted~~ input to the filter 180 to be filtered at t_4. When the filtering is complete, the filtered signal shown as S_4 is ~~inputted~~ input to the signal transmitter 190 at t_5 to be transmitted to external systems.

Kindly replace paragraph [0036] with the following amended paragraph:

[0036] Namely, when the A/D conversion of the sensor signal from the fluxgate 100 is completed by the A/D converter 170, the control signal B from the pulse controller 110 is converted to a low level signal. Since the control signal B being input to the AND gate 160 is now a low level signal, the pulse is blocked from being ~~inputted~~ input to the first and second current amplifiers 130 and 131, and current is not applied to the driving coil 150. Therefore, an amount of current applied to drive the fluxgate is reduced.

Kindly replace paragraph [0039] with the following amended paragraph:

[0039] Preferred embodiments of the present invention have been disclosed herein and, although specific terms are employed, they are used and are to be interpreted in a generic and descriptive sense only and not for purpose of limitation. Accordingly, it will be understood by those of ordinary skill in the art that various changes in form and details may be made without departing from the spirit and scope of the present invention as set forth in the following claims.

Kindly cancel the Abstract of the Disclosure and add the new Abstract of the Disclosure attached at page 21 of this paper.